Metal Shavings Short Circuit

Test **8:**

Bundle: Seven wires (6 over 1) of BMS 42A/8/1-16 specification, 15 inches in length.
Metal Shaving: Steel; 75 mils by 10 mils
Circuit Resistance: 1 Ohm
Generator: **3** phase, 400Hz, 120 line to neutral (208 line to line), 10 kVA.

Observations	Test 8
Flash	Yes
Strong Arcing	No
Circuit Breakers Tripped	No
Damage Length	0
Number of Wires Failing Wet Dielectric Test	0 of 5

Initially a thin steel shaving was used and when the power was applied to the sample the circuit cleared (opened) immediately. The oscilloscope indicated that there had been a current with a **85** Amp peak for ½ cycle and then zero current. The sample was taken apart and there found to be slight discoloration of some of the insulator but the shaving was intact. Apparently the edges of the shaving evaporated, opening the circuit.

The sample was remade with a thicker shaving (75mils by 10 mils) and the lacing tape holding the sample together was pulled tighter than before. When the power was applied there was a visible flash and then the sample was dormant. None of the circuit breakers tripped. The oscilloscope indicated 2 ½ cycles **of** current with an ***85*** Amp peak. There was little damage to the surrounding insulation and all wires passed a wet dielectric test.

Test **9:**

Bundle: Seven wires **(6** over 1) of BMS 42A/8/1 - **16** specification, **15** inches in length.
Metal Shaving: Steel; **65** mils by **28** mils
Circuit Resistance: 0.5 Ohm
Circuit Breakers: Effectively **15** amps
Generator: 3 phase, **400Hz, 120** line to neutral **(208** line to line), 10kVA.

Observations	Test **9**
Flash	Yes
Strong Arcing	No
Circuit Breakers Tripped	**No**
Damage Length	1.5
Number **of** Wires Failing Wet Dielectric Test	5 of 5

In this test a thicker steel shaving ***(65*** mils by **28** mils) was used in an attempt to avoid the quick evaporation found in Test **8.** When power was applied to the sample, the B1 circuit breaker tripped after **220** milliseconds of **85** amperes peak current. No flash or damage to the insulation was observed. The circuit breaker was reset and the power was reapplied with the same result.

The circuit was then changed **so** that the A1 and ***A2*** circuit breakers were put in parallel **as** was the **B**1 and **B2** circuit breakers. This effectively increased the circuit breakers in series with the pre-damaged wire from **7.5** to **15** amperes. It also decreases the circuit resistance to 0.5 Ω in series with the sample. When the power was applied there was 350 millisecond with a **125** amp peak short circuit current followed by intermittent flash type events for **200** milliseconds (Figure 33). This caused physical damage to the wire insulation and deposited black soot for about 3/4" surrounding the pre-damaged area. The oscillogram indicates that the **C** phase wire (previously undamaged) became involved in the arc with current peaks of 100 Amperes. None of the circuit breakers tripped. All ***5 of*** the non pre-damaged wires failed the wet dielectric test indicating substantial damage to the insulation.